the writer the other stations, including Sydney, Brisbane, and Wellington for personal equation. At Southport connection was made with the observatories at Sydney and Brisbane, and from Doubtless Bay with Wellington.

It was on September 29, 1903, that the first mutual observations and clock exchange were had with Sydney, and so this night may be considered as the one when for the first time longitude from the west clasped hands with longitude from the east, and the first astronomical girdle of the world was completed.

In making the comparison at Sydney between the longitude brought from the east with that from the west, I have used the value of Prof. Albrecht for the arc Greenwich-Potsdam 0h. 52m. 16·051s., and for the arcs from Potsdam to Madras, *viâ* Teherân, Bushire, Karachi, Bombay, and Bolaram, those of Major Burrard, giving for the longitude of Madras 5h. 20m. 59·235s.

As there has been no re-determination of the various arcs from Madras to Australia, I have adopted the values given in the Australian report of Ellery, Todd and Russell.

Applying these latter to the longitude of Madras, we get for the longitude of Sydney

	h. m. s.	s
	10 04 49 ...	0·355±0·088
The Canadian value is	10 04 49 ...	0·287±0·058
Difference	... ...	0·068

equivalent for the latitude of Sydney to 84 feet. The 1886 value for Sydney is 10h. 04m. 49·54s.

The final values of the Canadian determinations are:—

Final Longitude Values.

Station	Longitude			
	Time	Prob. error	Arc	Prob. error
	h. m. s.	s.	° ′ ″	″
Vancouver . .	8 12 28·368 W.	±0·050	123 07 05·520	±0·75
Fanning . . .	10 37 33·774 W.	±0·054	159 23 26·610	±0·81
Suva.	11 53 42·389 E.	±0·055	178 25 35·835	±0·82
Norfolk . . .	11 11 41·146 E.	±0·056	167 55 17·190	±0·84
Southport . . .	10 13 39·782 E.	±0·056	153 24 56·730	±0·84
Sydney. . . .	10 04 49·287 E.	±0·058	151 12 19·305	±0·87
Brisbane . . .	10 12 06·044 E.	±0·073	153 01 30·660	±1·09
Doubtless Bay .	11 33 56·146 E.	±0·060	173 29 02·190	±0·90
Wellington . .	11 39 05·087 E.	±0·075	174 46 16·305	±1·12

OTTO KLOTZ.

Ottawa, December 30, 1905.

THE KANGRA EARTHQUAKE OF APRIL 4, 1905.

AFTER a lapse of only eight years since the great earthquake of 1897, India suffered another calamity of the same nature on April 4, 1905, less in violence and extent, but more calamitous in its results, for it claimed a death-roll of 20,000 souls. An interesting preliminary account of this earthquake, by Mr. C. S. Middlemiss, appears in the concluding part of vol. xxxii. of the *Records of the Geological Survey of India*, where the total area over which the shock was felt is estimated at about 1,625,000 square miles, as against 1,750,000 in 1897. The area over which the shock was destructive is smaller in proportion than these figures would suggest, for the isoseist corresponding to 10 degrees of the Rossi-Forel scale includes only 200 square miles, and that corresponding to 8 degrees of the same scale 2150 square miles, as against 300 and 145,000 in 1897. In comparing these figures an allowance must be made for the personal equation, and it seems that, if Mr. Middlemiss's standard had been adopted in 1897, the former of these figures would have been considerably increased and the latter somewhat reduced.

There were two centres of great violence, one near Kangra and Dharmsala, where the tenth degree of the Rossi-Forel scale was surpassed, the other in the Dehra Dun, where the ninth degree was not reached. Between these two the violence was much less, and Mr. Middlemiss points out that the two districts of greatest destruction lie, each, in an embayment of the course of the great boundary fault of the Himalayas; they are the only two irregularities in the generally even sweep of the boundary of the Tertiaries of the sub-Himalayan tract, and as the general effect of the Tertiary, and post-Tertiary, folding and fold-faulting has been to obliterate irregularities in the outline of the mountain-foot, it is natural to suppose that any marked irregularities still left may be in a peculiar state of strain, especially liable to give rise to geotectonic movements. Those which took place on April 4 last seem to have exhausted themselves

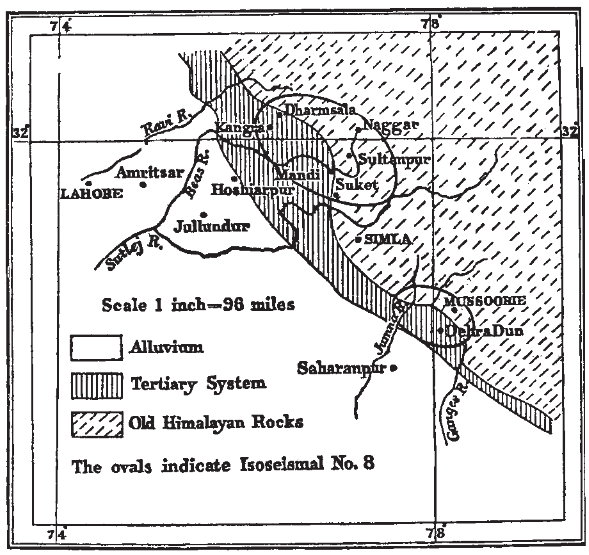

FIG. 1.—Origin of the Kangra earthquake of April 4, 1905.

underground, for no surface faults or changes of level were detected.

The nature of the shock seems to have differed from that of 1897, when all accounts agreed in describing it as simple, with only one marked maximum of violence. In 1904 there were, both in the Kangra and Dehra Dun districts, two or three distinct shocks, and we may mention that this is reflected in the long-distance records of the shocks, which indicate at least two distinct impulses, following each other at an interval of a couple of minutes, whereas in 1897 there was no indication of more than a single impulse. The violence of the shock at its greatest seems to have been a little less than in 1897; at Kangra Mr. Middlemiss's observations give the acceleration of wave particle as about 13 feet per second per second, the amplitude as 9.75 inches, and the period as 1.57 seconds. The time of origin, as deduced from local observations, is said to have been 6h. 9m. 0s. Madras time, within a second or two of error; the rate of propagation was 1.95 to 1.98 miles per second as between the origin and the seismograph stations at Bombay, Calcutta, and Kodaikanal, but it must be

remarked that this rate refers to the large motion on the Milne seismographs, not to the felt shock, the discussion of which is deferred to the larger memoir promised.

Among miscellaneous effects of the earthquake it is mentioned that in some cases the flow of springs was more or less completely checked, while others increased or broke out in new places. In Sind and Burma the shock was not felt, but affected the bubbles of level tubes during survey operations, the movement in the former district indicating a surface tilt of about 30 seconds of arc above and below the horizontal, in a north-east–south-west direction.

HENRY JAMES CHANEY.

ON February 13 Henry James Chaney, who for more than forty years was an authority on our standards of weight and measure, ended his lengthy official career at Hampstead after a painful illness of some months' duration.

He was born at Windsor in March, 1842, was educated privately, and entered the Civil Service at an early age. In 1860 he was appointed to the Exchequer, the department in which at that time the statutory powers with respect to weights and measures were vested. Here he had the good fortune to come into contact with Airy and Miller, who had just completed their researches, undertaken at the instance of the Government, in connection with the restoration of the Imperial standards. Profiting by their advice and encouragement, he devoted himself with much zeal to the technical duties which were imposed upon his department by the Sale of Gas Act, 1859. Under the direction of H. W. Chisholm, the Warden of the Standards, he took an important part in perfecting the official apparatus for verifying gas-measuring instruments. He acted as secretary to the Standards Commission, 1867–71, and had much to do with the preparation of the voluminous appendices to its reports.

On the abolition of the separate office of Warden of the Standards in 1878, Mr. Chaney was placed in charge of the Standards Department of the Board of Trade. As superintendent of weights and measures he was responsible for the model regulations with respect to weights and measures on which the local regulations throughout the country have been based. He was for many years the representative of the United Kingdom on the Comité International des Poids et Mesures, and took an active share in its proceedings. When the metric system of weights and measures was made permissive in this country in 1897, Mr. Chaney compiled the new tables of metric equivalents which were legalised the following year by Order in Council.

Mr. Chaney's scientific writings are for the most part to be found in the periodical publications of the Standards Department, and include, *inter alia*, "Report on the Standards of Measurement for Gas," "Verification of Standards for the Governments of India and Russia" (1877), "Screw Gauges" (1881–3), "Densities and Expansions" (1883), "Expansion of Palladium," "Re-comparison of the Imperial and Metric Units" (1883), "Verification of the New Parliamentary Standards of Length and Weight" (1881–3). His "Re-determination of the Mass of a Cubic Inch of Distilled Water" (Phil. Trans., 1892), which was intended to serve as a basis for calculating the relation between measures of capacity and volume, gave for the cubic contents of the gallon the value 277·463 cubic inches, a much better approximation than the value 277·274 cubic inches, due to Kater, which was accepted up to that date. The researches which have since been undertaken at the Bureau International des Poids et Mesures, and are still in progress, have yielded a provisional result for the mass of a cubic decimetre of distilled water at its maximum density which leads to the value 277·420 cubic inches for the cubic contents of the gallon. This does not differ much from Chaney's result, and is to be considered as the best determination up to date.

His well known work "Our Weights and Measures," which appeared in 1897, contains a mass of metrological information not readily accessible elsewhere. One of his latest contributions to science was the article "Weights and Measures" in the supplement to the ninth edition of the "Encyclopædia Britannica." His last official publication was a report on the "Construction and Verification of a New Copy of the Imperial Standard Yard" (1905).

His great experience in precise measurement caused him to be regarded as a valuable cooperator, and his advice was frequently sought by official committees. The Imperial Service Order was conferred upon him in 1902, and the services rendered by him in connection with the restoration of the Russian standards of weight and measure were recognised by the present Tsar as well as by his grandfather, Alexander II.

Mr. Chaney's name has long been familiar in metrological circles, and his death has removed another link with the past. The memory of his kindly disposition and ready assistance will be treasured by all those who were in any way associated with him.

NOTES.

WE are informed that the council of the Royal Society has selected the following candidates for election as fellows of the society:—Dr. C. W. Andrews, Mr. G. T. Beilby, Mr. F. F. Blackman, Prof. T. J. I'Anson Bromwich, Mr. P. H. Cowell, Mr. W. Heape, Mr. J. H. Jeans, Dr. C. H. Lees, Captain H. G. Lyons, R.E., Prof A. B. Macallum, Mr. J. E. Marsh, Dr. P. Chalmers Mitchell, Mr. J. Swinburne, Prof. H. A. Wilson, Prof. A. E. Wright.

A MEETING was held at the Mansion House on Monday, the Lord Mayor presiding, to consider what steps should be taken to commemorate the discovery by Dr. W. H. Perkin fifty years ago of the first artificial colouring matter obtained from a coal-tar product, and to celebrate the great development of the coal-tar colour industry thus started. A note describing the origin and nature of the movement appeared in these columns on February 15 (p. 370). The proceedings at Monday's meeting were opened by Lord Halsbury, who moved:—"That, in view of this being the fiftieth year of the foundation of the coal-tar colour industry, it is desirable that steps should be taken to memorialise the event and to do honour to Dr. W. H. Perkin, the founder." Sir William Bousfield seconded the motion, which was supported by the Master of the Leathersellers' Company and Prof. H. E. Armstrong, and unanimously carried. Lord Rayleigh moved:—"That an appeal be made in this country and abroad for subscriptions for the purpose of carrying out the following objects:—(1) The presentation to Dr. Perkin for his lifetime of an oil portrait of himself, executed by an eminent artist, the portrait to become the property of the nation at his death. (2) The execution of a marble bust of Dr. Perkin to be placed in the rooms of the Chemical